8Ka TEMPERATURE CHANGES

WHAT IS THE DIFFERENCE BETWEEN INTERNAL ENERGY AND TEMPERATURE?

The particles that everything is made from are always moving. The energy stored in the movement of particles is called **internal energy**. It is sometimes called **thermal energy** or 'heat' energy. Energy is measured in **joules (J)**.

Temperature describes how hot or cold an object is. It is usually measured in **degrees Celsius (°C)**.

Temperature and internal energy are not the same. We can measure temperature with a thermometer, but we cannot measure the amount of internal energy something contains in the same way.

The amount of internal energy stored in something depends on:

- its temperature
- the material it is made from
- its mass.

A | Each spark given off by the sparkler is at a very high temperature, but the sparks do not store enough internal (thermal) energy to burn your hand.

B

1 a| What is the difference between internal energy and temperature?
b| What units are used to measure them?

2 Why don't you get burned by the sparks from a sparkler?

3 Look at photo B.
a| Which contains the greatest mass of water: the kettle or the mug?
b| Is the water in the kettle or mug storing the greatest amount of energy? Explain your answer.
c| Why do you think it takes longer to boil a kettle full of water than to only boil enough to fill the mug?

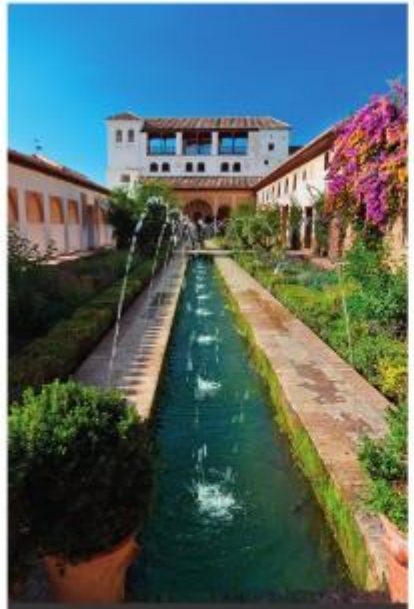
FACT

The coldest place on Earth is in Antarctica. A temperature measurement made by satellite recorded a temperature of −93.2 °C in 2010.

Energy stored in a substance can be transferred by heating. Energy flows from a hotter object to a cooler one. The bigger the difference in temperature, the faster the energy is transferred. The cool object becomes hotter and the hot object becomes cooler until they are both at the same temperature.

4 Look at photo C. The temperature of the air in the room is −5 °C. The temperature of the drinks is 70 °C.
a| Will energy flow from the drinks to the room or from the room to the drinks? Explain your answer.
b| One of the drinks is left for 10 hours. Explain what its final temperature will be.

C | A room in an ice hotel: ice hotels are built every winter in some countries where the temperature stays below 0 °C for several months.



D | This palace in Spain was built 700 years ago. The fountains help to keep the gardens cool.

Cooling by evaporation

Evaporation is a way of transferring energy. A liquid evaporates fastest at its boiling point, but it can evaporate at any temperature. The fastest moving particles in a liquid are the ones that escape to form a gas. The particles that are left are storing less energy as movement and so the temperature of the remaining liquid is lower.

5 Your body produces sweat when you are hot.
a| What temperature is the sweat when it is first produced? Explain your answer.
b| Explain how sweating helps to cool you down.

6 Look at photo D. Explain how the fountains help to keep the gardens cool.

7 Jatin says, 'We don't know what the coldest temperature on the Earth is.' Give as many reasons as you can why he is right.

I can ...

- explain how internal energy and temperature are different
- identify the direction in which energy will be transferred
- explain what happens to particles when a liquid evaporates.

Do you think a bottle with a wet paper towel wrapped round it will cool down quicker than one with a dry paper towel?

Aim

To find out if sweat can help you to cool down.

Introduction

You can use a bottle of warm water wrapped in a wet paper towel as a model of a sweaty body.

Prediction

1 Do you think the water in the bottle will cool down fastest with or without the damp paper towel? Explain your prediction.

Method

A Wrap a paper towel around each bottle and fasten them with elastic bands.

B Hold the paper towel on one bottle under the hot water tap, until the paper towel is soaked with hot water.

C Pour the same amount of hot water into each bottle and stand them on the tray.

D Record the temperature of the water in each bottle and write it in a table (see below).

E Record the temperature every minute for 10 minutes.

Apparatus

- hot water from the hot water tap
- 2 plastic bottles
- 2 thermometers
- stopclock
- paper towels
- elastic bands
- tray

⚠ The water should not be too hot. Take care when wetting the paper towel.

Mop up any spills straight away.

Recording your results

Considering your

Friday 26th April 2019
26/04/19

Temperature and Heat

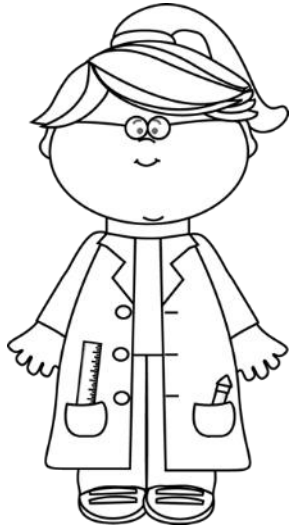
LO: To understand the difference between heat and temperature

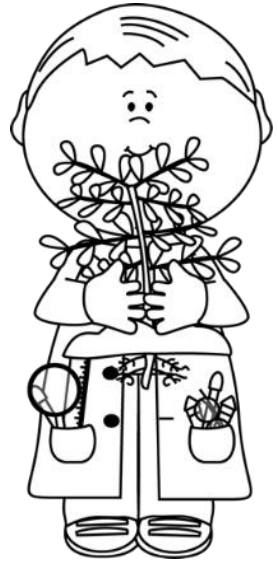
Recall the units for temperature and energy	
Describe what temperature and heat are	
Explain why things maybe hotter but contain less heat energy	

Key word

Heat

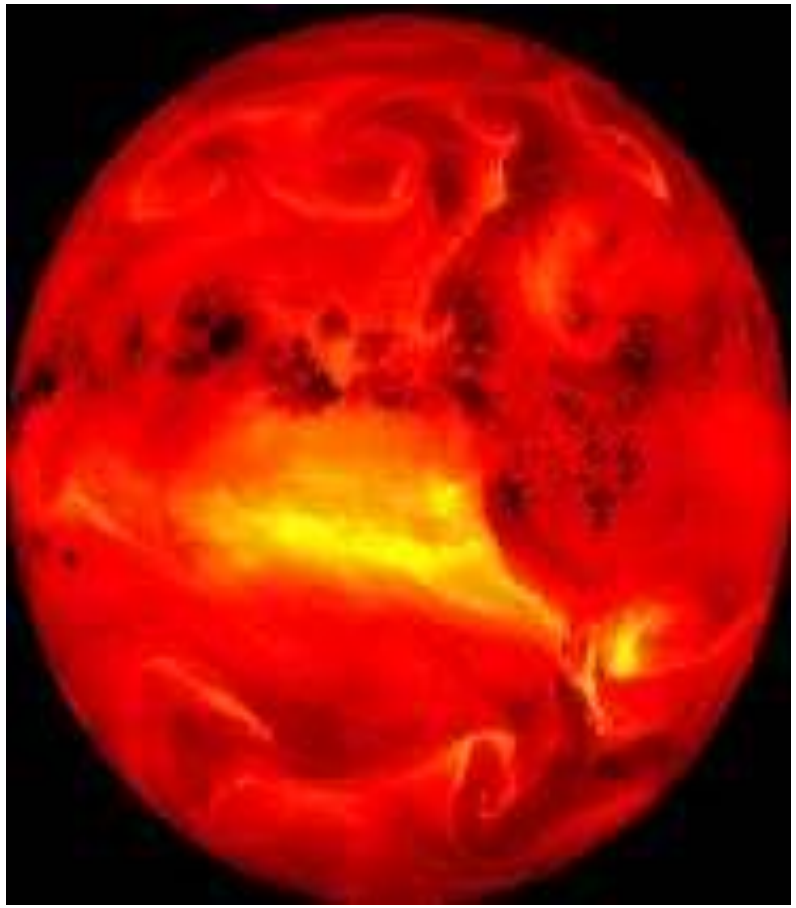
The amount of thermal energy an object has

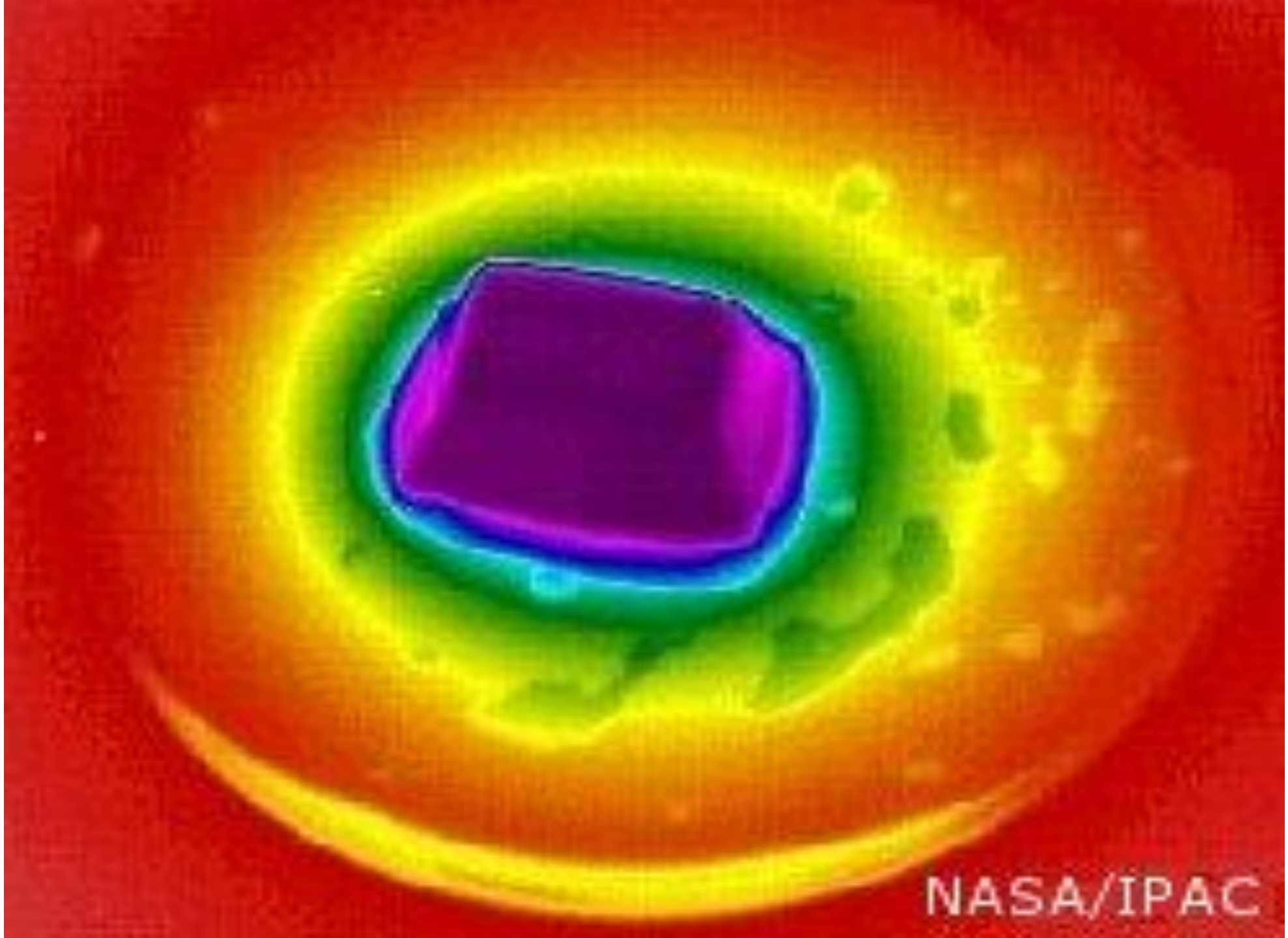


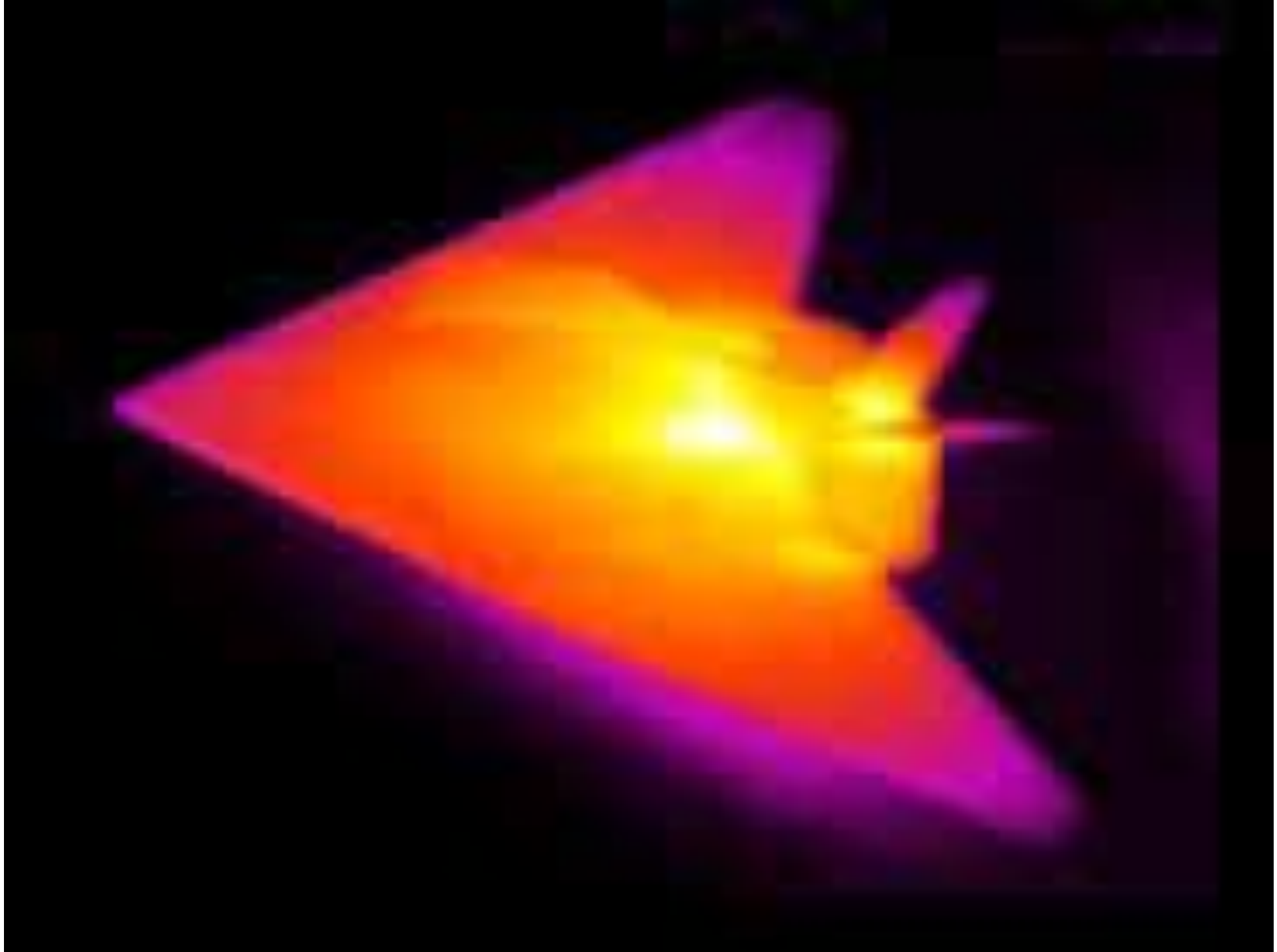


KEEPING IT HOT!

What do you think this is a photo of?




NASA/IPAC

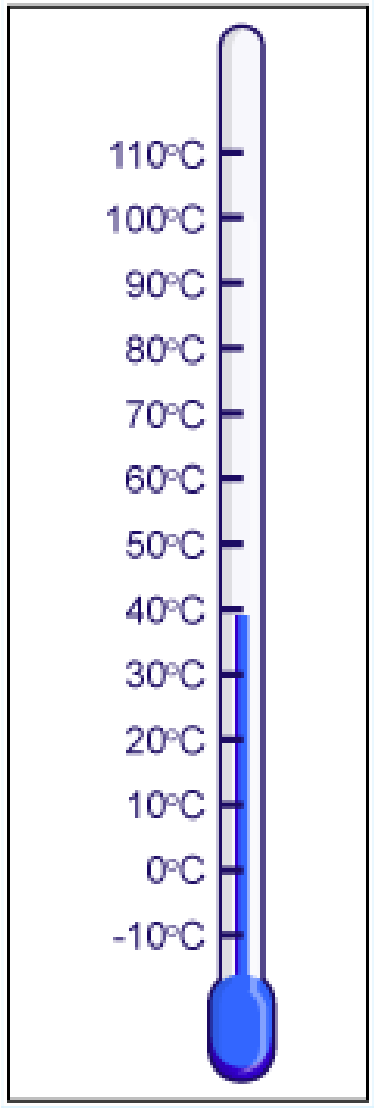



Notice anything strange about this picture??

Temperature and Heat

Temperature and heat are
NOT THE SAME.

Temperature



How hot or cold it is.

Measured in **degrees Celsius**.

Heat

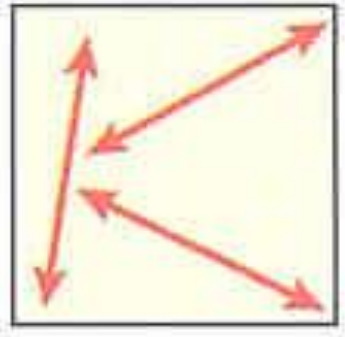
The amount of thermal energy, measured in **joules (J)**.

A cup of hot tea has **heat energy** in the form of the **kinetic energy** of its particles.

Heat vs Temperature

E.g. A white hot sparkler

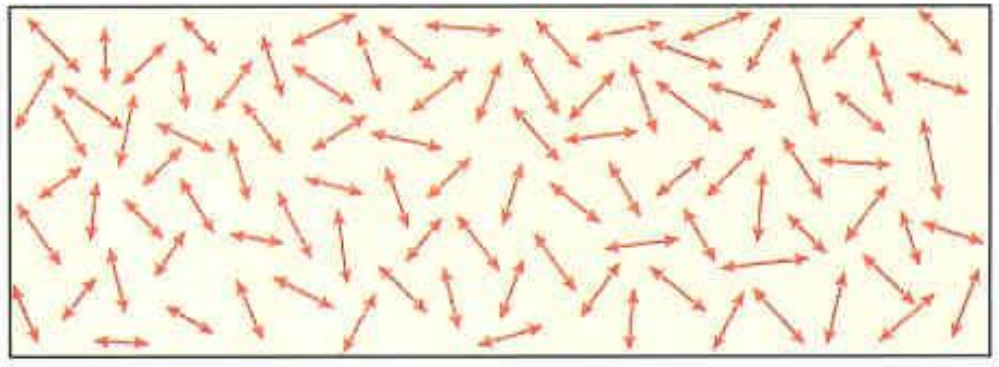
- The tiny sparks are at a very high temperature BUT there is very little heat energy because they are very small
- Each particle in the spark is VIBRATING
- Because it is very hot, they are vibrating a lot
- But as there are not many particles, the total amount of heat energy is **SMALL**



Heat vs Temperature

E.g. 2 A bath full of warm water

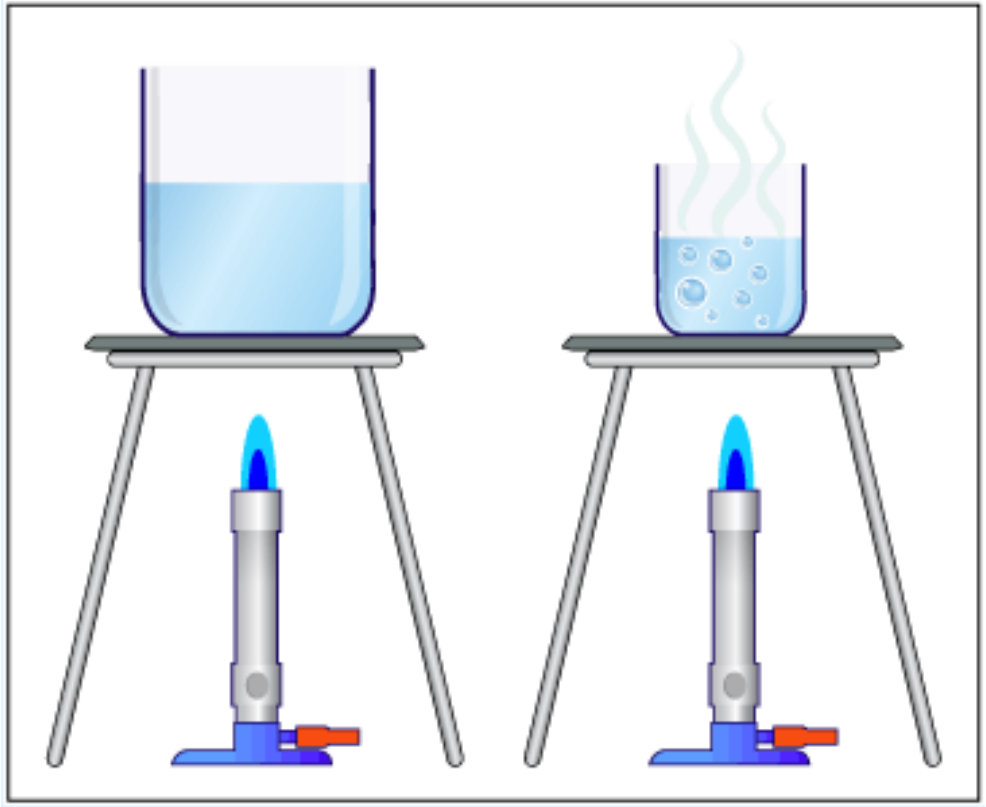
- The water is at a lower temperature than the sparkler but it contains more energy. This is because it contains more particles
- Each particle is vibrating less as it is at a lower temperature
- BUT because there are so many - there is more HEAT energy



Which will boil first?

The amount of internal energy stored in something depends on:

- its temperature
- the material it is made from
- its mass.



The large beaker contains more water and needs more thermal energy or heat to reach 100° C

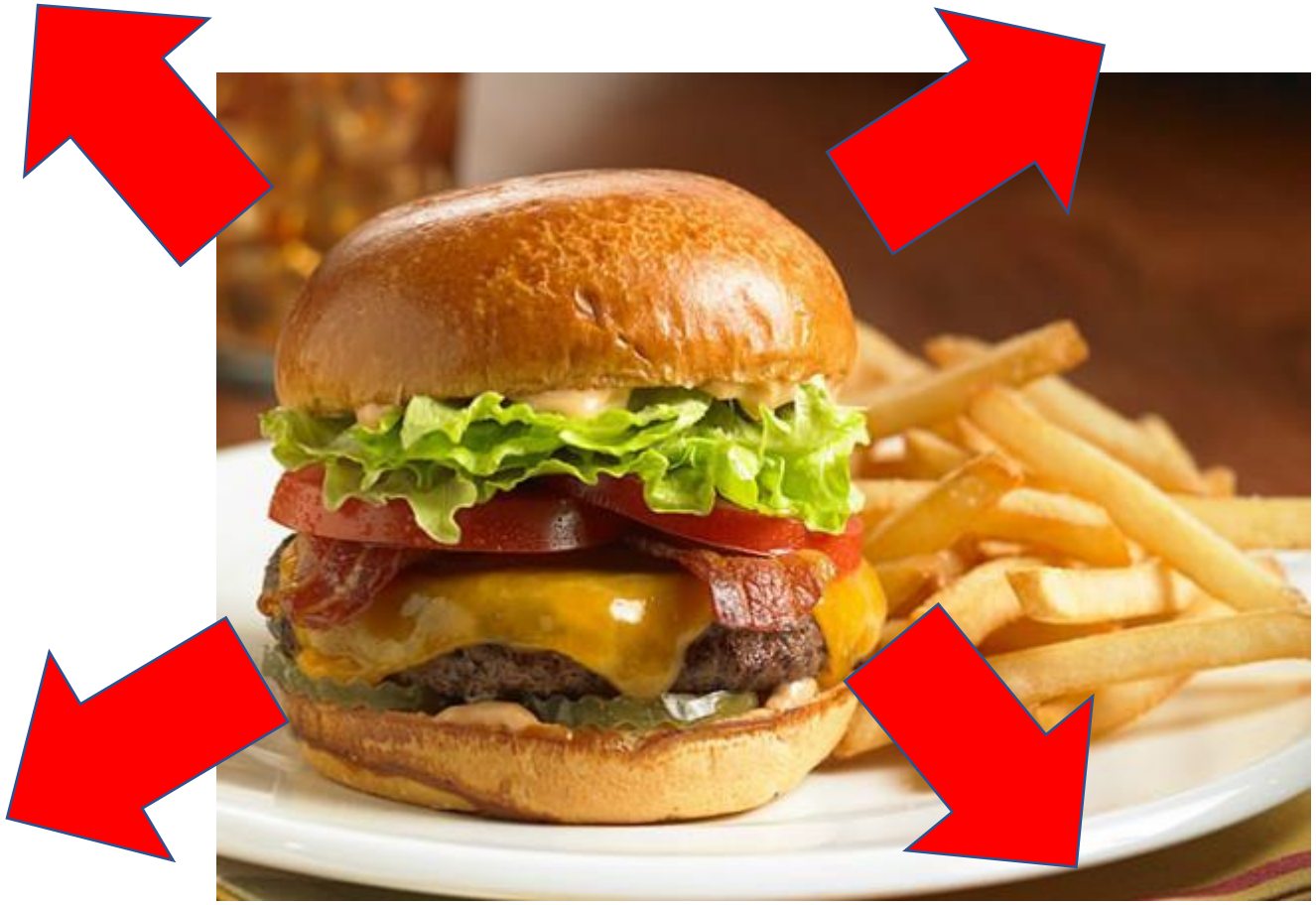
Which way will energy flow?

- ***Energy flows from a hotter object to a cooler one***
- The bigger the difference in temperature the quicker the energy is transferred
- The cool object becomes hotter and the hot object becomes cooler until they are both the same temperature

Will energy flow from the drinks to the room or from the room to the

One of the drinks is left for 10 hours. Explain what its final temperature will be.

Which way will energy flow?



Which way will energy flow?

Which way will energy flow?

Which way will energy flow?


KEEP
CALM
IT'S INDEPENDENT
Work
Time

Finish these sentences…

- Temperature measures ……
  It is measured in….

- Heat is the amount of ….
  It is measured in ….

Just Checking

The particles that everything is made from are always [redacted] The [redacted] stored in the movement of particles is called [redacted] **energy**. It is sometimes called [redacted] **energy** or 'heat' energy. Energy is measured in [redacted]. [redacted] describes how hot or cold an object is. It is usually measured in **degrees** [redacted]

Temperature and internal energy are [redacted]. We can measure temperature with a thermometer, but we cannot measure the amount of internal energy something contains in the same way.

Celsius
energy
Joules
moving
not the same
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